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What is claimed is:

1. A process for continuously hydrocyanating 1,3-butadiene in the presence of at least one catalyst, which comprises using, as catalysts, nickel(0) catalysts stabilized with phosphorus chelate ligands, 1,3-butadiene and hydrogen cyanide in a molar ratio of from 1.6:1 to 1.1:1.

2. The process according to claim 1, wherein the nickel(0) catalyst is saturated with phosphorus chelate ligands, the phosphorus chelate ligands being selected from the group consisting of bidentate phosphites, phosphines, phosphonites, phosphinites and phosphinite phosphites.

3. The process according to claim 1 or 2, wherein the continuous hydrocyanation is additionally carried out in the presence of at least one Lewis acid.

4. The process according to any of claims 1 to 3, characterized by the following process steps:

   (a) continuously hydrocyanating 1,3-butadiene in the presence of at least one nickel(0) catalyst having chelate ligands and, if appropriate, in the presence of at least one Lewis acid, 1,3-butadiene and hydrogen cyanide being used in a molar ratio of from 1.6:1 to 1.1:1 to obtain a mixture 1 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile;

   (c) continuously isomerizing 2-methyl-3-butenenitrile which is present in the mixture 1 over at least one dissolved or dispersed isomerization catalyst to give 3-pentenenitrile, resulting in a mixture 2.

5. The process according to claim 4, wherein the 3-pentenenitrile obtained in process step (c) is hydrocyanated in the presence of at least one nickel(0) catalyst having phosphorus ligands.

6. The process according to claim 4 or 5, wherein the isomerization in process step (c) is effected by heating the mixture 1 to from 80 to 125°C.

7. The process according to any of claims 4 to 6, wherein the continuous isomerization carried out in process step (c) is carried out in the presence of at least one Lewis acid.

8. The process according to any of claims 4 to 7, wherein, between process step (a) and process step (c), the following process step (b) is run through:

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(b) distillatively removing 1,3-butadiene from the mixture 1.

9. The process according to any of claims 4 to 8, wherein the isomerization catalyst used in process step (c) is the nickel(0) catalyst having chelate ligands used in process step (a).

10 The process according to claims 1 to 9, wherein the hydrocyanation is carried out in the presence of additional monodentate phosphorus ligands selected from the group consisting of phosphines, phosphites, phosphinites and phosphonites.

11. The process according to claim 10, wherein the additional monodentate phosphorus ligand used is a ligand of the formula II

$$P(X^1R^1)(X^2R^2)(X^3R^3) \qquad \text{(II)}$$

in which

X^1, X^2, X^3 are each independently oxygen or a single bond and R^1, R^2, R^3 are each independently identical or different organic radicals, or mixtures thereof.

12. The process according to claims 10 and 11, wherein compounds of the formula IIa

$$(\text{o-tolyl-O-})_w(\text{m-tolyl-O-})_x(\text{p-tolyl-O-})_y(\text{phenyl-O-})_2P \qquad \text{(IIa)}$$

are used, where w, x, y, z are each a natural number and the following conditions apply:

$w + x + y + z = 3$ and $w, z \geq 2$.

13. The process according to claims 10 to 12, wherein the additional monodentate phosphorus ligand of the nickel(0) complex and/or the additional monodentate free phosphorus ligand is selected from tritolyl phosphite and the phosphites of the formula IIb

$$P(O\text{-}R^1)_x(O\text{-}R^2)_y(O\text{-}R^3)_2(O\text{-}R^4)_p \qquad \text{(IIb)}$$

where R^1, R^2 and R^3 are each independently o-isopropylphenyl, m-tolyl and p-tolyl, R^4 is phenyl, x is 1 or 2 and y, z, p are each independently 0, 1 or 2, with the proviso that $x + y + z + p = 3$, and mixtures thereof.